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ABSTRACT

This paper is concerned with the educational significance of interactive video. To clarify this, seven basic educational concepts are reviewed: (1) education and training are organized forms of learning; (2) goals and objectives can be grouped into the cognitive, affective, and psychomotor domains of learning; (3) education refers to learning processes in the broad sense while training deals primarily with skills; (4) methods used to support learners in attaining objectives involve didactics and learning theory; (5) informational feedback is more useful than knowledge of results alone; (6) the pace of feedback is related to both the proficiency of the learners and the nature of the learning tasks; and (7) research findings on the optimal balance of control over learning are contradictory. Seven statements on interactive video are then presented. Three of these statements refer to current educational possibilities and limitations of interactive video, including information supply/retrieval and learning/training; computer-assisted instruction (CAI); and functional and situational criteria for using interactive video. Three statements discuss future developments including integrated applications; home recording of videodisks, digitalization of video signals, and telecommunications; and developments in educational theory and cognitive psychology. The final statement suggests ways to reduce the costs of the design and production of interactive video. The paper concludes with a number of questions important in assessing the educational validity of concrete interactive video programs. (DJR)

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Seven statements on interactive video

F. Gastkemper

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SEVEN STATEMENTS ON INTERACTIVE VIDEO

Paper for the first IFCEB-conference, Amsterdam, March 1985

Abstract

This paper is concerned with the educational significance of interactive video. To clarify this, some basic educational concepts are reviewed first. Then seven statements are presented. The first three refer to the current educational possibilities and limitations of interactive video. The following three deal briefly with some significant future developments. The last one suggests a few ways to reduce the cost of design/-production of interactive video. The paper concludes with a number of questions which are considered important in assessing the educational significance of concrete interactive video-programs.

Mr. Chairman, Ladies and Gentlemen,

The main objective of this presentation is to give you some clues for appreciation of the educational significance of Interactive Video in terms of basic educational concepts. This I would consider achieved, when you could use these concepts to evaluate the basic educational structure of interactive video-programs which you are looking for or that will be demonstrated to you here and elsewhere. In such demonstrations it is important not to get immersed in technical wonders or in arguments about specific content-messages which you happen to be familiar with but which could be changed quite easily.
All this implies that relatively little attention will be given to the technical aspects of interactive video-systems, hardware-developments, program-development strategies, actual applications or cost. Instead, it is assumed:

- that you are familiar with interactive video as a videodisk- or cassetterecorder-system which is controlled by a computer;
- that this computer can be external or built into the videomachine;

- that computerprograms can reside on the video-disk or -tape itself, on eprom, (audio)cassette, floppydisk, or harddisk;
- that input-facilities can be simple like a remote control unit, more complex like a computer keybord or a touch panel, or even more elaborate like voice-input;
- that output usually takes the form of screen-images, with or without sound;
- and that image-presentation can be on dual or single screens.

In the latter case video-images and computer-generated text can be alternated between, but they can also be combined in so-called 'overlay' format.

The actual set-up of interactive video does not matter so much for the rest of this presentation, although it seems only fair to say that interactive videodisk and especially the laser-type disk is most popular at the moment. This type is generally felt to be superior to interactive videocassette because of its fast and random access and its capacity for rock-steady still-frames without wear. Which does not mean however, that interactive videocassette could not be a very good solution for specific training problems, or is completely obsolete. Pros and cons on this topic however will have already been dealt with in the earlier presentation by Joachim Eyl.

As far as Computer Based Learning is concerned, you probably were already more or less familiar with the interactive use of computers for learning and training before this conference and will be clearly more so after yesterday's presentations. So now, the time has come to proceed to the several statements on interactive video which I would like to make. For a better understanding of these however, I have to review with you some basic educational concepts first.

0. Some basic educational concepts.

0.1. Trivial as it may seem, we need to keep in mind that education and training are organized forms of learning. In its broadest sense, learning is defined as a change or adaptation of behavior. In this sense everybody is learning continuously, from day to day, out of sheer necessity, for fun or even by accident. Organized learning however is characterized by explicit goals or objectives, methodi-

cal support to arrive there, and formal checks on the learner's performance and progress.

0.2. Goals or objectives can be grouped into three main categories:
1. the cognitive domain (referring to the realm of intelligence),
2. the affective domain (a.o. referring to attitudes), and
3. psycho-motor objectives (referring to perception, movement and coordination). Interactive video can play a part with relation to all three types of objectives, but let us concentrate for the moment upon the cognitive domain, where it is most frequently put into practice. Within this domain, again a rough grouping of objectives is possible:
1. knowledge,
2. comprehension (concepts, rules, laws, procedures etc.), and
3. skills (ranging from fairly simple ones like arithmetic to very complex ones like problem-solving). Skills always imply some level of knowledge and comprehension and are oriented upon the application thereof, in your mind or in reality.

0.3. The term 'education' is mostly used for learning-processes in a broad sense, that is: for learning in all (3) domains and, within those, for all types or levels of learning. Within the cognitive domain, training is mostly dealing with skills, and especially with highly structurable skills of a so-called algorithmic nature. In addition to that, training is mostly aiming at a highly proficient level of performance regarding such skills, preferably mastery.

0.4. Regarding methods to support learners in attaining the objectives, especially in the cognitive domain, didactics and learning theory come into play. This is not the time or the place to go into theory deeply, but prevailing cognitive learning models imply that at least three basic educational functions should be fulfilled to provide the desired, methodical support to the learner:
1. the supply of relevant information,
2. the activation of learning activities through questions, tasks, etc., and
3. the evaluation of learning activities like answers and solutions, including feed-back on these activities.

0.5. As to feed-back, it is relevant to distinguish between two main types: Knowlegde of Results (KR) and Informational Feed-back (IF). Knowledge of Results simply will let the learner know whether his/her answer is right or wrong. Yet this is an important function, especially in the case of errors, because it enables the learner to engage in corrective activity. This guidance is more complete however, when messages take the form of Informational Feed-back, where errors are not only signalled, but also identified and corrected. In most research reports this second type of feed-back has been acknowledged as the more useful and effective after learner errors than Knowlegde of Results alone.

0.6. In an overview of research on feed-back in Educational Technology journal of last january, Vicky Blum Cohen relates the pace of feed-back to the proficiency of learners as well as to the nature of the learning task involved. A few of her findings:

- low mastery learners seem to be helped most by immediate feed back;
- high mastery learners can be impeded by immediate feed-back in their pace of learning; more important to this type of learners is end-of-session (or unit) feed-back;
- intitial acquistion of knowledge and short-term retention have been shown to be facilitated by immediate feed-back;
- higher-level objectives like comprehension and application, as well as long-term retention seem to be facilitated by end-of-session feed-back, especially with high-mastery learners.

To draw a conclusion in her own words '...there is no reason why an instructional designer could not use both immediate and end-of-session feedback in one program. The important point is that the designer should base decisions upon careful analysis of program goals and target audience, and then use either one with discretion and care'.

0.7. A last important point regarding learning strategies and didactics concerns the balance of control over learning. Especially in the early computer based learning-programs the control over content-presentation, step-size, sequence etc. was resident in the computer-program. Even in the case of branched programs there was mostly only limited flexibility offered. With other types of programs like

simulations and with changes in didactic concepts the locus of control was shifted more and more towards the learner.

As yet it is not completely clear whether program control or learner control is the better choice with relation to learning results. Studies in this area have come up with complex relations and sometimes contradictory conclusions. Some recent research in this area however suggests that student control over strategy is the more educationally effective one (Hartley, 1981).

Much clearer than the outcomes on learning results are learners' preferences for learner control as opposed to program control. In an article in Educational Technology journal of june 1984, Diana Laurillard of the British Open University describes an experiment with interactive video on this topic. In this experiment learner control is available to students in:

1. the control of mode (more receptive, when information is given, as opposed to more active, when practicing),
2. the control of sequence (of content), and
3. the control of strategy (deviation from the expected alternation between modes and how much practice learners took).

In her own words:

'The overwhelming conclusion from this study is that students can make full use of most aspects of control, and moreover make use of it in such a variety of ways that it becomes clear that program control must seriously constrain the individual preferences of students'.

This conclusion ties in nicely with some statements of Vicky Blum Cohen in an earlier article in Educational Technology journal of january 1984. Among other things, she emphasizes the modular organization of content and adaptability to different user needs of interactive videodisk materials, the latter for instance through the offering of pre- and/or posttests.

I would like to finish the discussion of basic educational concepts here. Everybody present will realize that the information given so far is of a very elementary nature and by no means comprehensive. Still I believe that even these very basic concepts can put some educational perspective on the nature of interactive video. Let's try.

1. **Interactive video can be a powerful medium for both information supply/retrieval and for learning/training. These uses can and will be combined, but should not be confused.**

For some years it has been common practice to identify different types of interactive video with help of the level 1/2/3-model, which was originated by the Nebraska video design and production group (Daynes, 1982). Apart from being technically outdated, this model does not offer a direct or explicit identification of interactivity in the educational sense. For this, a rough grouping of interactive videoprograms into information-supply 'only' and training programs proves more adequate.

The first type, especially in the format of a video-databank (on disk), is a powerful addition to the information-supply side of learning/training situations. But in terms of the three basic educational functions as discussed above, applications of this type do not provide any stimulation of learning/training activities as such, or any evaluation in terms of feed-back on learning/training activities.

Yet different levels of interactivity can be distinguished with relation to video-databanks. These, however, refer to the ease and possibilities for finding the desired information. They vary from the use of printed catalogues and simple menus, activated by input of specific numbers or chosen alternatives, to far more sophisticated information-retrieval systems, activated by using and combining key-words or even free text.

The second type of interactive videoprograms, which are directly and explicitly developed for learning/training purposes, is characterized precisely by the attempt to provide all three basic educational functions: information, activation and evaluation. As with regular computer-based learning/training programs, the ease and possibilities for using interactive videoprograms is a function of the learning/training program itself. To a large extent this is determined bij clear instructions on how to use the program, the availability of adequate help-functions and the sturdiness of the program in being 'student-proof'.

The more important aspect of interactive video learning/training programs however, lies in the additional power of video-images for each of the three basic educational functions. With relation

to this interactive video for learning/training should not be seen as a combination of a primarily receptive phase of video-information, followed by learning-activities and feed-back, but as an integrated learning/training situation, in which video-images can be used as essential components for information as well as for activation of, and feed-back on learning activities. Of course, video-databanks can be made available as a part of these integrated interactive videoprograms. In such cases, the use of a video databank can be considered a new and valuable possibility under 'learner-control'. But from the use of a video databank as such no (intended) learning effects should be expected automatically. For this, eliciting specific learning activities and providing adequate feed-back are indispensable.
Naturally, these functions can not only be integrated within a more comprehensive interactive videoprogram. They can also be taken care of in other ways, like combination of video databanks with printed texts, with personal assistance etc.

2. Interactive video as a means to learning/training should be regarded as a (powerful) format of Computer Aided Learning. This implies certain possibilities as well as limitations.

As discussed above, each of the basic educational functions to be provided in learning/training programs can be augmented by integration of video-images. It was also said, however, that from an educational point of view interactive video for learning/training is characterized by the combined availability of all (three) basic educational functions. And precisely this also constitutes the essence of what a really self-contained and comprehensive computer aided learning/training program will offer. So, without underestimating the power of video-images with relation to the basic educational functions, interactive videoprograms can be adequately regarded as -greatly enhanced- computer aided learning/training programs.
As yet, only little empirical research has been reported on the effects of interactive videoprograms. However, from what has been done so far and what has been described as essential above, it is very reasonable to expect benefits of interactive video which are comparable to those of Computer Based Training in

general. Especially results like reduced training time, improved job performance and increased learning satisfaction have been demonstrated time and again with CBT-programs.

On the other hand, it also stands to reason to expect limitations of interactive video which are comparable to those of CBT in general. Apart form technical restrictions on the presentation of information (like level of resolution, number of colors, etc.) these limitations are directly related to the quality of interactive video/CBT-programs. According to Alfred Bork the quality of such programs is primarily determined by:

- the type of input allowed;
- the analyzing method to handle inputs;
- the action taken subsequently.

To some extent, expanding the variability of input allowed is dependant upon improvements in the systems area (keybord, touch screen, graphics tablet, mouse, voice, etc.). Possibilities like these are developed continously, with already amazing results. Part of the variability of input allowed, however, ties in with the content of responses (multiple choice, calculations, open answers, paragraphs, questions, etc.) and through this, with the analyzing power of interactive video/CBT-programs. This not only asks for sophisticated programming, but perhaps even more for insights in the nature of language and learning which are not yet readily available today.

The same goes for the most adequate action to be taken after analysis of responses. In reaction to responses, feed-back for instance should be based on a (didactic) teaching/training model as derived from learning theory. But the available models are mostly of a general nature and not directly applicable on the level of concrete and individual interaction. This is why most existing interactive video/CBT-programs offer only limited analyzing power and limited possibilities for adequately individualized action.

In practice, the underlying models for learning/training used are predominantly based on logic and/or experience. Here, logic refers to the nature of the learning task involved, and experience to the learning behavior of students/trainees in working on the same or comparable tasks in other or earlier situations. To develop a functional and effective interactive learning/training

program is easiest, when learning tasks are well-defined and highly structurable, and when the more difficult tasks-elements viz. the most likely errors are known.
Admittedly, this is not the ultimate way to develop interactive video/CBT-programs. But if the available knowledge and tools are applied with care, even pretty straight-forward models can lead to succesful programs for a lot of learning/training tasks.

3. At the moment, educationally sound applications of interactive video should (at least) be based on criteria for the use of both CAL and (video-)images as such. Cost factors and situational analysis can provide strong additional arguments.

To the extent that interactive video for learning/training is characterized by the individualized interaction itself, the basic criteria for using it are (again) comparable with those for the use of CBT in general. Roughly these criteria can be grouped into functional and situational motives.
Functional motives are derived from the (didactic) characteristics of CBT and the results of its usage. Of the latter, the main benefits of CBT have already been mentioned above.
Situational motives are more explicitly oriented to the actual practice of learning/training, and very often to the solution of financial and/or logistic problems thereof. With relation to this, the main advantages of CBT are:
- maintaining training standards/quality, while reducing resources;
- virtual independence of training from specific times and/or places;
- increased convenience for the learner/trainee.

Motives for the use of audiovisual materials or components in learning/training have been discussed many times before and not always in a very rational way. After review-studies on the possiblities and effects of audiovisual materials in learning/training, the Dutch Open University has determined a basic functionality of these materials according to which the use of AV-media is indicated:
- when phenomena or processes need to be (re-)presented in a

realistic way because they are objects of learning/training, while it is impossible to study them in reality (too dangerous time-consuming etc.), AND/OR

- when phenomena or processes are not adequately (re-)presented through printed text and/or stills, because of their dynamic nature, complexity etc. The validity of this criterion can be dependent on the entry-level of the target-audience(s).

Combining criteria for the use of CBT with those for audiovisual materials, the use of interactive video for learning/training is (at least) indicated:

- when students/trainees should acquire knowledge and/or (cognitive) skills which can be structured well, wich ask for intensive study/excercise and for individualized feed-back on progress, AND
- when certain phenomena and/or processes need to be (re-)presented in a realistic way because they are object of instruction, while it is not possible to study them in reality, and/-or because it is not possible to (re-)present them adequately through text, graphics or computer-generated models only (Gastkemper & van Enckevort, 1984).

As this reasoning is primarily referring to the functional aspects of interactive video for learning/training, it does not hold true automatically for video databanks. Furthermore, the stated functional criteria can be reinforced and will sometimes even be overruled by situational criteria. For instance, when it is possible to express costs and benefits of an intended program more or less accurately in terms of money, and one is dealing with large numbers of students/trainees, an interactive video-program could be preferred over a combination of self-study and group-sessions because of the logistic advantages of the first. Of course, in such a case both training formats should be able to fulfil the required educational functions.

The basic functional as well as situational criteria as mentioned above, provide a sound basis for the actual use of interactive video, because they offer virtually undeniable reasons. Next to these additional motives can be more or less important, like enhanced motivation of students/trainees, variation in

learning/training situations etc. Even if these additional motives in most cases can not be directly related to improved learning effects and/or reduced cost, their possible validity should be always considered seriously and explicitly.

4. With growing experience, especially integrated (single screen) applications of interactive video will teach us the meaning of 'the whole is more than the sum of the parts' and add to the basic criteria.

Already it can be stated that through overlay of computer- generated and video-images on a single screen functional possibilities are created which can be motives for the use of interactive video in themselves. A realistic training situation, for instance, can be built gradually upon schematic representations. Or schematic diagrams can be super-imposed on static or dynamic real-life images. Or think of color-keying, arrows and other prompters in addition to and over realistic images. And all this throughout the learning/training task, built into the information-presentation, activation and evaluation viz. feed-back phases of the process.

Considering technology there is even more to expect. To quote Michael Allen in an interview in Educational Technology journal of february 1984: 'From a technological point of view I see the videodisk as an interim medium. It's the only economical device for us right now on which to store videodata'. And a little bit further: 'We need to merge videodisk capabilities and computer-generated graphics to the point where you really can't tell the difference between the two and you can use them simultaneously'. Obviously, such developments are underway and will offer us even more enhanced functional possibilities of interactive video, along lines as indicated above. Some of them are already becoming visible in the format which represents the state of the art probably best: the arcade game.

Of course, the use of games for education and training has been wellknown and fairly wide-spread for a long time already, but the enormous popularity of sometimes highly sophisticated computergames is likely to give a new impetus to this.

So far, most 'serious' applications of computergames appear to

be experimented with by the military. They are used to train coordination and motor skills, or tried out as diagnostic and predictive instruments with relation to more generic military tasks. This type of games supposedly combines the structural elements of 'regular' computer aided learning/training programs with those which are called characteristic of gaming in general: challenge, fantasy and an opportunity to mastery (Driskell & Dwyer, 1984; Nawrocki & Winner, 1983). The effectiveness of this type of games has not been demonstrated too clearly yet and their area of application has been pretty well restricted so far. Even so, more extensive experimentation with interactive video-games for learning/training purposes in a broader sense could lead us to surprising results.

5. Expected technical developments will further this, but will be most significant in their situational consequences. If accepted, these consequences could lead to a significant development in the 'learning/training culture', in typical learning/training environments as well as in the home.

Apart from technical developments as mentioned above, in Michael Allen's words, many others can be expected. To generalize a lot: all combined they will result in better, faster, smaller and cheaper systems, which will be available sooner than is expected now. To wager a more specific forecast on these developments is dangerous, but in my opinion the most important of these are already underway. The ones I mean are: the possibility of (home)-recording of videodisks, the economic digitizing of videosignals and the powerful capabilities of telecommunication systems like advanced cable-networks and (satellite-) broadcasting.
If these technical developments are made available to the general public at affordable prices, they could very well mean a major change to the traditionally accepted ways of learning and training, especially in their situational aspects. As to the (home-) recording of videodisks, it is highly probable that 'computerized' and standardized machinery will be available as a substitute for videocassette-recording and because of its technical superiority will penetrate the consumer-market deeply within the next five years. Now imagine a situation where it is

possible to record automatically (on a set time) an interactive videoprogram on your own machine, from a programmed series which is broadcasted day and night. Or an educational network, from which you can order your interactive videoprogram by connecting to it (for a short time) and making your choice from a catalogue.

It is easy to see to what extent such systems could change the structure of learning/training situations. For one thing, they could make home an important place of learning/training at the most suitable times. For another, they could make the learner/-trainee a more independent and personally responsible one. The very existence of technical possibilities however, does not grant such an outcome. For these possibilities to be used on a large scale and thus to be affordable, there should be also a wide-spread demand.

It is not my intention to provide an in-depth, sociological analysis of the demand for education/training or the evolution towards an information-society here and now. But major phenomena in modern society like fast-changing job-requirements, more and more free time and even un-employment all seem to make people more receptive to new and flexible possibilities for information, learning and training as described above. Should these get used widely, the more traditional systems for teaching/training could be in danger of getting obsolete very rapidly unless they open up and adapt to the new possibilities.

6. Fundamental changes with relation to the basic limitations of interactive video are not primarily to be expected from technical improvements, but will depend on developments in educational theory, cognitive psychology and their operationalisation in training systems. These developments ask for fundamental improvement of insights in the way people learn and therefore can't be expected on short term.

However exciting the new possibilities and their possible impact on the structure of learning/training situations are, even advanced systems a described above can never be better than the programs they offer. With relation to the quality of interactive

videoprograms as discussed earlier in this presentation, it was already stated that their basic limitations like those of computer aided learning/training in general, are not so much of a technical but rather of a scientific nature. Or in other words: we just do not know enough about language, learning and teaching to build easy-to-use and flexible and really individually adaptive programs upon.

Research on these related, but also widely varying topics asks for contributions from many scientific disciplines and is often referred to under the heading of 'artificial intelligence'. It deals with models and software for interpretation and generation of natural language, a.o. to facilitate input and output of computer-programs for learning and training. But also with new models and software for learning and teaching, such as relational knowledge bases and expert-systems. Or with special problems like aiming at learner control and nevertheless providing highly individualized feed-back, and so on and so forth.

A (far) more comprehensive presentation on artificial intelligence developments will be delivered later, bij Tim O'Shea. At this point however, it should be indicated that progress is being made on all topics as mentioned, if only slowly or in restricted areas for some of them. Because of the fundamental nature of the questions involved, it will take some years yet before enough answers can be given tot substitute prevailing approaches to program-development for more advanced and precise ones. But as soon as some more comprehensive models for learning/teaching can be put into practice, they will not only provide a better foundation for structuring programs but most likely also an improved and more effecient softwaretool to develop them.

7. Lowering the design/production costs of interactive video can be achieved in several ways. One of the more promising ways could be the production and distribution of disks as 'half-products' e.g. in the format of 'generic disks'.

Under the different headings of last three statements we had a brief and somewhat speculative look at future developments in the area of interactive video and computer aided learning/

training in general. To conclude this series of statements, let us return tot the actual practice of interactive video and especially to the cost of program design/production. Reliable figures on these costs can not yet be given, not even as crude averages. Estimates to be found so far vary from 'somewhat more than a regular audiovisual program will cost' to many hundred thousands of dollars and even more. Moreover, estimates are not always clearly and directly proportional to the size, complexity and content of the programs involved.

Apart from this, it is generally accepted that the costs of program design/production are the more important when compared to those of distribution and use of programs. Of course the latter should not be neglected. But as far as these are dependent upon the required hardware-components, they could be seriously reduced by developments in the consumer-market as described above. And as far as they are dependent upon the purchase of the programs/disks themselves, the costs of program design/production can be considered of prime importance indeed. In a relative sense, these will be reduced by larger numbers of program-users and/or longer periods of program-usage. As such, they are predominantly determined by the required manpower and can be only reduced by limiting this factor.

Until recently, interactive videoprograms were mostly designed and produced in their (integrated) completeness, for use in specified situations by specific target-audiences. Two trends, however, are emerging which deviate from this (integrated) approach and which could result in reduced costs.

The first one concentrates upon design and production of larger units, even complete curricula, for learning and training. It is predominantly originated by well-known publishers and will have some effect on reducing design/production costs, but even more so on the cost of distribution and usage because of the intended general applicability of programs and through this, their use by large numbers of users.

The second trend tries almost exactly for the opposite, i.e. the design/production of modular units rather than complete programs or even curricula. With relation to interactive video, this modular approach is mostly referring to more or less independent

audiovisual and computerprogram-parts. In this approach it is possible to reduce design/production costs of relatively stable and versatile 'source-materials' by co-production or even buying such materials when offered by publishers. Audiovisual source-materials of this type can be put on videodisk as a (redundant) collection of images, from many different angles, on many different aspects or phases of a certain subject or theme. The use of such a 'generic' disk can then be adapted to specific learning/-traning-needs by integration with a tailor-made computer-program.

Especially in areas like higher education and job-specific training this latter approach seems promising. Even if it is not applicable all the time, in such cases as it is it would be a less expensive and sometimes faster way of program design/production. However, the remaining costs of developing the teaching/training logic and as far as still required, also the content of the program, should not be underestimated. To reduce design/production costs of computer-programs as much as possible, in most cases the input of professional people and teamwork is necessary to warrant quality as well as efficiency. Some further reduction of costs can be only hoped for when better models and more 'intelligent' systems for authoring/programming become available, e.g. as a result of research in artificial intelligence.

Before I finish this presentation, let me remind you of its objective as stated at the beginning: to give you some clues for appreciation of the educational significance of interactive video in terms of basic educational concepts. To a certain extent this significance can now be determined by answering the following questions:

1. - Is this a program for training or for information purposes 'only'?
2. - If this is a program for information purposes only, is it sufficiently user-friendly in that it not only provides the information itself but also an easy-to-use method for finding it?
3. - If this is a training program, is it selfcontained in that
   - it supplies (at least) the relevant information;
   - it elicits learning activities which are relevant with relation to the intended or stated learning objectives;

- it delivers feed-back of a truly informational nature when learners make errors?

4. - If this is a training program, is it suffficiently adaptive in that it offers facilities to adjust the frequency of feed-back (immediate vs. end-of-session) to learners proficiency (high vs. low mastery) and the nature of the learning tasks (knowledge vs. comprehension and application)?
5. - If this is a training program, is it sufficiently learner friendly in that it offers opportunities for learner control with relation to sequence of content and to strategy, and -if needed- means of flexible usage by different user-groups or -levels?

Even though these questions are certainly not exhaustive with relation to the educational value of interactive video for training purposes, in practice you will not find many applications for which the above questions could all be answered with a 'yes'. Apart from this being difficult for some of the questions with relation to a single program, this is not too bad, as long as more 'yesses' can be registered than 'no's'. Are-n't we only at the very beginning with interactive video?

Thank you for your attention.

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